



- 2.9 VIDEO PROJECTION SYSTEM TECHNICAL REQUIREMENTS - EXPANSION AND MODIFICATION
  - 2.10 VIDEO PROJECTION SYSTEM PROJECTION SYSTEM TECHNICAL REQUIREMENTS - MECHANICAL
    - 2.10.1 Projection Cube Display Unit
    - 2.10.2 Data/Graphics Projector
    - 2.10.3 Maintainability
    - 2.10.4 Projection Cube Display Screen
  - 2.11 VIDEO PROJECTION SYSTEM TECHNICAL REQUIREMENTS - CONFIGURATION
  - 2.12 VIDEO PROJECTION SYSTEM TECHNICAL REQUIREMENTS - EXPANSION CONFIGURATION
    - 2.12.1 Design Criteria for Future Integration
  - 2.13 VIDEO PROJECTION SYSTEM TECHNICAL REQUIREMENTS - VIDEO PROCESSOR
  - 2.14 VIDEO PROJECTION SYSTEM TECHNICAL REQUIREMENTS - INTERCONNECTIONS
- PART 3 EXECUTION
- 3.1 SYSTEM B - OPERATOR CONSOLE SYSTEM
  - 3.2 OPERATOR CONSOLE SYSTEM TECHNICAL REQUIREMENTS - FUNCTIONAL
  - 3.3 OPERATOR CONSOLE SYSTEM TECHNICAL REQUIREMENTS - STANDARD COMPONENTS
  - 3.4 OPERATOR CONSOLE SYSTEM TECHNICAL REQUIREMENTS - EQUIPMENT KITS
  - 3.5 OPERATOR CONSOLE SYSTEM TECHNICAL REQUIREMENTS - STRUCTURAL COMPONENTS
  - 3.6 OPERATOR CONSOLE SYSTEM TECHNICAL REQUIREMENTS - EXTERIOR PANEL CONSTRUCTION
  - 3.7 OPERATOR CONSOLE SYSTEM TECHNICAL REQUIREMENTS - WORK SURFACE CONSTRUCTION
  - 3.8 OPERATOR CONSOLE SYSTEM TECHNICAL REQUIREMENTS - ELECTRICAL POWER DISTRIBUTION
  - 3.9 OPERATOR CONSOLE SYSTEM TECHNICAL REQUIREMENTS - WIRING/CABLE RACEWAY

-- End of Section Table of Contents --



The complete control room solution, identified as two systems; System A Overview Display System comprised of a mosaic tile map board system and video projection system, System B operator console system, must be installed and integrated into the [CCAFBEICF] [\_\_\_\_\_] in a maximum of twenty weeks from the final approval of all submitted drawings and approvals.

## 1.2 PROJECT OVERVIEW

The following specification is a detailed description of the Complete System to be purchased by the [USAF] [\_\_\_\_\_] . The Complete System is to be utilized at the [CCAFBEICF] [\_\_\_\_\_] .

System A's mosaic map board and video projection system is to provide overview and customer adjustable display capabilities of the electrical distribution system. The primary function of the map board is to depict a static representation of the electrical distribution system while incorporating mosaic tile technology to allow for easy updates to the system. The mosaic map board system must be expandable for future allowance of the operator to view and control the device status and the normal and current conditions of the system by adding dynamic indications and an output controller system.

System B's operator console solution is to be the command center for the distribution dispatch operators incorporating monitor placement and storage areas customized to meet daily operational needs.

Dimensions, appearance, quality, and required functions of the materials, equipment, and products described within this specification must conform to sound engineering practices and meet or exceed the specified requirements. Additional items not stated in this specification, but necessary to properly complete the project must be considered as part of the work.

## 1.3 SUPPLIER'S GENERAL OBLIGATIONS

The supplier must assume responsibility for the design and fabrication of the Complete System in conformance to customer supplied specifications and/or drawings. The supplier must also assume responsibility for any described testing and installation. The supplier's obligation must include, but not be limited to, the following list and other obligations required to perform the functions described in this specification.

Design engineering, including adaptation of the [United States Air Force] furnished design plans, existing equipment limitations, and supplied project information.

The supplier must be responsible to meet all dimensional requirements including any radius specified by drawings.

Supplier in-house fabrication and assembly of System A and System B including any noted options. Exceptions to in-house fabrication include video projection system components which can be sourced by manufacturers that meet the stated requirements.

Supplier must provide new equipment with no previous title with documentation verifying new production system.

Factory acceptance format and testing (FAT) of the entire contract deliverables prior to packing and shipment of Complete System.

Project Engineering Services including, project management, project scheduling, bi-weekly progress reports and final submittal documentation with equipment manuals, drawings, and other documentation including installation procedures.

Assurance of the availability of spare parts, service, and expansion components for a ten (10) year period from date of acceptance for all components that comprise system.

Specialized tools, test equipment or software described in specification to provide a "turn-key" solution.

Complete System shipment via air-ride furniture van method to [Cape Canaveral Air Force Base, Cape Canaveral, Florida] [\_\_\_\_\_].

Installation of the complete system including structure, subassemblies, components, and unit wiring. Start up, testing of supplier installed electronics and/or training of the [United States Air Force CCAFBEICF] [\_\_\_\_\_] personnel.

Site Acceptance format and Testing (SAT) of the entire contract deliverables.

One year warranty from the commissioning date (SAT) of the Complete System on all equipment and components of all systems provided with exception to component consumables.

#### 1.4 PURCHASER'S GENERAL OBLIGATIONS

The [USAF] [\_\_\_\_\_] must supply the following items and services as part of the System A mosaic tile map board system with integrated video projection system and System B operator console system.

Primary AC power source for the Complete System including power cabling to the connecting junction point of the system as detailed.

Climate controlled environment for the Complete System location within the [CCAFBEICF].

Selection of the mosaic map board graphics including size and color.

Documentation of the initial display graphics and system representation layout to be depicted on the map board.

Technical review and approval of the manufacturer's design, documentation, and testing procedures.

Coordination of supplier's activities with the [CCAFBEICF] [\_\_\_\_\_] operating requirements.

Any [CCAFBEICF] [\_\_\_\_\_] furnished equipment for installation into the Complete System by the Supplier.

Computer input/output equipment required to interface host computer to the map board controller.

Supply of composite video and RGB signals for video projection system and operator console system to termination point specified by Supplier in

design/build approval process.

#### 1.5 QUALITY STANDARDS

Design, materials, manufacturing, testing, and documentation must conform to the following codes and standards and is required to prove conformity upon the purchaser's request.

Supplier ISO 9001 registered policies.

Occupational Safety and Health Act (OSHA), and the [CCAFBEICF] [\_\_\_\_\_] safety standards.

Electronic Industries Association (EIA).

National Electric Code (NEC-latest revision), and Local, City, and County electrical and building codes.

National Electronics Manufacturing Association (NEMA).

Manufacturer of the control room systems must have an in house quality control program to insure that all material and services are in accordance with or exceed all applicable specifications in connection with any contracts of which manufacturer is the Subcontractor.

#### 1.6 QUALIFICATIONS

The supplier must be an ISO 9001 registered company and demonstrate compliance to its ISO 9001 procedures.

The supplier must demonstrate a minimum of five (5) years experience in integrating all components detailed in this specification.

The supplier must employ a minimum of one (1) video display hardware and software networking engineer employee(s) dedicated to support supplier's video projection system installations and servicing.

The supplier must perform complete installation of Complete System utilizing supplier's in-house resources.

#### 1.7 DOCUMENTATION

To ensure that the Complete System to be supplied conforms to the specific provisions and general intent of the Specification, the Supplier must submit drawings and documents including standard and custom hardware and software design, reference, technical, user, and maintenance documentation covering all System equipment to [CCAFBEICF] [\_\_\_\_\_] for review.

#### 1.8 SUBMITTAL DOCUMENTATION

Detailed layout drawings scaled depicting the location, alignment, type of equipment structure anchoring details, mechanical and electrical installation information of the Complete System for approval.

Three sets (3) of samples of all fascia and blank panel types.

Revised approval drawings resubmitted to [CCAFBEICF] [\_\_\_\_\_] within five (5) business days for a maximum two (2) revision cycles and re-submittal processes.

Bill of Material, wiring schematics, and data sheets for approval.

Project Schedules updated when impacted by Supplier or Purchaser changes affect the overall Project Schedule.

Complete System Parts List for submittal and approval.

Factory and Site Acceptance Test format and checklist(s) for use during testing.

## 1.9 FINAL DOCUMENTATION

Supply three (3) sets of all final documentation (both drawings and other documents), that include all changes that occur prior to system acceptance by [CCAFBEICF] [\_\_\_\_]. All documentation and drawings prepared specifically for [CCAFBEICF] [\_\_\_\_] must also be supplied on electronic media (CD-ROM).

Site planning manual that provides mechanical and electrical installation details. These documents must include drawings of all display system parts and related hardware, indicating mounting details, clearance requirements, electrical connections and power requirements, and environmental restrictions including schematics.

Operation, references, technical, and maintenance manuals for all system equipment and test equipment. These documents must include the diagnostic manuals, user manuals, and instruction manuals as well as any available troubleshooting aids.

Existing standard software and firmware manuals covering the display processing hardware.

Software functional, operating, and design documents, including reference and system user documentation.

List of recommended standby parts for the Complete System with ordering instructions.

Wiring diagram of Power and Distribution wiring for dynamic display indicators applications.

A certificate of compliance must accompany the shipment of each deliverable product under this Contract. This certificate must verify that the product has been checked and has passed the Subcontractor's quality control inspection and test procedures described in the Subcontractor's quality assurance plan.

## PART 2 PRODUCTS

### 2.1 SYSTEM A - OVERVIEW DISPLAY SYSTEM

This section describes the functional, mechanical, electrical, and spare parts requirements for the specified mosaic map board system and video projection system.

### 2.2 MOSAIC MAP BOARD TECHNICAL REQUIREMENTS - FUNCTIONAL

The map board must provide the [CCAFBEICF] [\_\_\_\_] with an interlocked,

continuously straight map board, providing dynamic representation of the system. The entire display panel must be of the mosaic-type construction utilizing a one-to-one ratio of high impact plastic grid carrier assembly and tiles. The plastic grid carrier assembly must be fabricated of non-shrinking, non-PVC, flame retardant and heat resistant material. The tiles must snap into the front of the grid and must be able to be used in any of the four possible orientations.

The system must be represented in the form of diagrams which are separated by a row, or rows of contrasting tiles. Diagrams must represent the system with the use of lines of various widths and colors, which are centered on one tile, together with various symbols in the specified shapes and colors. Standard symbols must be centered on individual tiles, but may span more than one tile.

### 2.2.2 Expansion and Modification

The map board must be expandable and must allow for modification of existing display graphics and illumination devices. The map board must be field expandable to add lines, symbols, graphics, additional tile area, and illumination devices. Additional tile areas beyond the original map board boundaries may be added to the existing panel without removal or interruption of the panel.

The mosaic map board system must include lenses incorporated into the 24 mm tile system for locations with future placement of dynamic indications. This requirement also includes the placement of binary coded decimal numeric display lenses for future integration of BCD numeric displays. Grid system cut-outs are required so that future BCD numeric displays can be snapped into the surrounding grid and viewable from the front of the mosaic map board. A list of lens types and quantities are supplied in Subpart 2.7.2.

## 2.3 MOSAIC MAP BOARD MECHANICAL REQUIREMENTS

The total mosaic map board size must consist of the following dimensions and as shown in [Appendix B] [\_\_\_\_\_] drawing number [2907-03-01] [\_\_\_\_\_-\_\_\_\_-\_\_\_\_]. A plan view of the control room showing the location of the map board structure are provided in [Appendix C drawing number 2907-09-01] [\_\_\_\_\_] . Supplier is responsible for verifying all clearances and access ways related to the delivery and installation of the map board.

### 2.3.1 Dimensions

Structure total lineal footage: [43 ft 6 in] [\_\_\_\_\_] . Structure Overall height: [11 ft 4-3/4 in] [\_\_\_\_\_] . Structure Maximum depth: [2 ft 1 in] [\_\_\_\_\_] . Curvature radius: [24 ft 0 in] [\_\_\_\_\_] . Total mosaic display panel length: [43 ft 6 in] [\_\_\_\_\_] . Total mosaic display panel height: [8 ft, 4 3/4 in] [\_\_\_\_\_] . Total bottom fascia length: [43 ft 6 in] [\_\_\_\_\_] . Bottom fascia height: [3 ft 0 in] [\_\_\_\_\_] . Total top fascia length: [43 ft 6 in] [\_\_\_\_\_] . Top fascia height: [0 ft 7 1/4 in] [\_\_\_\_\_] .

Support the display portion of each mosaic map board by free-standing welded steel frames and linear tie-bars resulting in a stand alone self supporting structure of sound design and manufacturing practices. The frames must be directly anchored to the concrete structural floor, and/or the ceiling of the control room. The structure must provide a positive means of ensuring the flatness, smoothness and alignment of all sections of



the display surface. The assembled mosaic map board must conform to the floor plan layout as shown in [Appendix C drawing number 2907-09-01] [\_\_\_\_\_] .

The support structures and any exposed metal surfaces of the exterior of the map board, including frame and/or enclosures and metallic grid carrier assemblies, must be smooth finished surfaces, thoroughly coated for corrosion resistance and finished with the supplier's standard finish.

The overview display structure must include a custom opening and mounting system for the video display components, specifically the projection cubes, communication and power wiring and video processing system detailed in Subpart 2.8. The structure must also include expandability for future implementation of video display components detailed in Subpart 2.9.

Bottom fascia portion must be finished with a base Medium Density Fiberboard (MDF) core and a [CCAFBEICF] [\_\_\_\_\_] approved acoustical rated sound absorption material finish covering.

**OPTIONAL - Supplier is to provide for an optional line item price for an addition of a catwalk at a pre-determined height to allow for normal maintenance of future dynamic indication and control systems. The catwalk(s) must have railings and kick plates and the entire catwalk system must meet or exceed OSHA standards. The catwalk(s), railings, and kick plates must be the length of the map board and be constructed of the same material as the mosaic map board structure. The catwalk system must be able to support 4 persons plus equipment simultaneously. The catwalk system must be finished with the same criteria as the structure.**

#### 2.4 SURFACE REQUIREMENTS

The basic element of the display surface of the map board must be a matrix of removable tiles. Tiles must be made of molded plastic of approximately 24 mm square, allowing for maximum detailing of the system to be depicted on the map board display area as well as ease in future diagram modification and expansion. The background tone of the tile must be beige, with the tile having the following properties:

- Non-conductive
- Mechanical strength
- Temperature resistance (non-expansive and non-shrinking)
- Flame retardant
- Self extinguishing (ASTM test D-635)
- Resistant to ultraviolet rays
- Dimensional Stability
- Non-reflective
- Chemical resistive
- Matte finish

The mosaic tile must have a non-glare surface of sufficient durability such that it withstands normal cleaning procedures recommended by the manufacturer, without the loss of the tiles non-glare characteristics. The surface finish must be uniform throughout the board, and must be able to be repeated when replaced or reordered.

The tiles must be mounted in a three dimensional support grid carrier frame and be capable of being placed in any 90 degree orientation. The mosaic tiles must snap into a grid backing which must support each tile against movement relative to adjacent tiles. Tiles must snap firmly into place with no visible gap, but must be easily removable without requiring removal

of any mounting hardware (i.e., clips, screws).

Tiles, when installed, must form a continuous surface, and must present a uniformly lineal surface along the entire length of the map board. The map board surface must conform to the specified arc. The curvature must be achieved through off-setting each adjacent tile in the horizontal orientation to each other to minimize the deviation between theoretical and manufactured curvature. Tile edges must be sharp and must precisely abut each other when assembled on the grid to give the appearance of a monolithic display surface. The display surface must be flat within  $\pm 0.5$  inches ( $\pm 1.25\text{mm}$ ) over the full height of the display. Tile sizes must not vary more than 0.004 inches (0.1mm) in height and width. When mounted, the gap between adjacent tiles must not exceed 0.004 inches (0.1mm). Discontinuities between the corners of adjacent tiles must not exceed 0.008 inches (0.2mm). The lines between tiles must be straight within  $\pm 0.02$  inches ( $\pm .5\text{mm}$ ) for a distance of 10 feet (3m).

The map board design must include provision for the removal and replacement of all tiles from the front of the panel. This feature may be accomplished by the use of special tools provided by the supplier with the map board. Cutouts and restoration of open areas for instrumentation, such as recorders, display readouts, clocks, etc. must be done easily and without affecting the adjacent areas of the display surface.

## 2.5 MOSAIC MAP BOARD SYMBOLS AND GRAPHICS

The required symbols for representation of the system are listed in [Appendix D].

Symbols, letters, digits, and graphic representation must be printed or engraved on the individual tiles by a painted ink silk-screen technique or equivalent method including paint filled engravings. The printed tiles ink must not peel, wash off, or fade over the life of the map board. Printings must not chip or abrade and the background color must not appear if the printed area of the tiles surface become scratched. Describe the exact methods used to apply the symbols and graphics in the proposal.

Colors of the mimic representation listed in Section 2.5.2 must be submitted to [CCAFBEICF] for approval and must be consistent across the entire mosaic map board. All markings must be indelible and must not be affected by typical household cleaners.

The Supplier must recommend and identify their standard legend, engraving and line width sizes. All sizes, styles and methods must be approved by [CCAFBEICF]. Graphics and legends must be clear and legible from a minimum viewing distance of 12 feet by a person with 20/20 vision.

Vinyl lettering and numbering methods must have a proven usage with the manufacturer's tile without peeling, fading, cracking or shrinkage. Vinyl must be able to withstand the same cleaning method as tiles and printings.

## 2.6 MOSAIC MAP BOARD GRID CARRIER ASSEMBLIES

The tiles must be supported by a three dimensional grid carrier system. The grid carrier components must connect together to form a single assembly. When assembled the grid carrier system must be rigid, providing a module for mounting each tile and also provide mounting and support for any dynamic indication devices. Illumination devices must be able to be used in any module in the grid carrier assembly.

The grid carrier components must be made of non-metallic material and consist of the same properties listed in Section 2.4.1.

In addition to the above properties the components must snap and lock together to form the three dimensional modular assembly. The assembled grid must be able to be field modified without the use of special tools or cutting.

The finished grid assembly must be mounted in a frame which is part of the support structure. The frame must be finished in the manufacturers standard finish and must provide strength and support to the outer perimeter of the mosaic assembly.

## 2.7 EXPANSION CAPABILITIES FOR FUTURE INTEGRATION OF MOSAIC MAP BOARD DYNAMIC INDICATING SYSTEM

The mosaic map board is static with the requirement to allow for future integration of dynamic indication devices. Section 2.7 details the design criteria for the dynamic indications to meet the proposed static mosaic map board, including dynamic indicators, numeric displays and output control systems and are indicated by "**Design Criteria for Future Integration**".

### 2.7.1 Light Emitting Diodes

The map board must eventually use illuminated display devices to provide indication of different status conditions, which is not covered under this contract. However, the tiles depicting future changeable state devices must include a clear circular lens to give a dynamic representation of the devices' state (i.e., on/off, alarm) and must be LED's (light emitting diodes). The following table indicates the quantities and type of symbol.

Symbol Label	Quantity	Symbol Type
--------------	----------	-------------

Breaker 140		
-------------	--	--

Disconnect 520		
----------------	--	--

#### 2.7.1.1 Design Criteria for Future Integration

Dynamic status indication must be represented by solid state high intensity Light Emitting Diodes (LED's ). Red and Green individual LED Indicators and Red/Green bi-color LED Indicators must be available for use in the mosaic map board.

Manufacturer must describe the size, brightness and quantity of the LED's which must have a rated life expectancy of 100k hours minimum.

Individual LED and Multi-LED's must be mounted to an LED holder. LED holders are to be non conductive and each holder must be mounted in a three dimensional support grid carrier frame with the capability of being placed in any 90 degree orientation. The LED holders must snap into the grid and be held firmly in place with out any mounting hardware (i.e., clips, screws), and must be easily removable without the use of tools.

Multi LED's must have multiple LED's in a single package and must be able to be configured in a 1 X 2 matrix per holder. Individual LED's must be able to be configured in a 3 X 3 matrix on each holder. Each holder must contain the necessary electronic components to provide the proper voltage and current for each LED. Components must be rated at 50% above the

calculated values.

Wiring to each holder must be neat and must meet NEMA and ANSI codes. LED's must be wired so that the individual holders can be relocated in a 7 foot radius from the point of origin without rewiring. Wiring connections to the components or plug couplers on the LED holders must be soldered connections utilizing the latest technology.

#### 2.7.2 Digital Displays and Readouts

The map board must have the following binary coded decimal numeric display lenses mounted in the face of the map board. Quantities, type of signal, number of digits and size are listed in the table below.

No. of Digits	Quantity	Size of Digits	Signal Type	Units
3 Digit	8	1" BCD	KV	4 digit
16	1" BCD	MW/MV	6 Digit	Clock
1	1"	Hr. / Min.		
		/ Sec		

##### 2.7.2.1 Design Criteria for Future Integration

Supplier must provide power supplies for any non self powered displays. Supplier must also be responsible for display mounting and wiring of the displays to the power source. Each display must provide a connector for signal and power source wiring. Site installation of the signal wiring to the displays is the responsibility of the customer. Mounted readouts must not impede the use of any adjacent tiles.

Serial BCD display controller(s) for the digital displays must communicate with the host computer system via a standard RS232 interface. Each display controller must operate on a RS485 multi drop network via a single twisted pair cable and have the following features:

- Grid mountable
- 8 four digit or 4 eight digit configuration
- Leading zero blanking
- 256 multi-digit BCD display capability
- Synchronized flash and blink capability
- Controller display system software user's license
- Controller display system documentation and maintenance manual
- Selectable baud rates from 4,800 to 38,400
- Minus sign capability

##### 2.7.2.2 Map Board Display Control System

The dynamic indicators must be driven by a Serial Communication Display Control System (SCDCS) with a total system capability of controlling from 1 to 16,384 output points from a single RS232 serial communications link. Interface of the host computer to the SCDCS must be via the serial port and to the dynamic indicators via serial communications with the Distributed Output Controllers. The SCDCS controller must be originally configured to drive the dynamic indicators plus twenty (20) % spare capacity.

##### 2.7.2.3 Design Criteria for Future Integration

The state of each display indicator is maintained by the system until it is changed by the host computer or manually by a remote test station. Each point must be able to be simultaneously tested from the remote test station without affecting the current display status via a software based

Maintenance Program.

Each Individual point must have the capability of being controlled in one of the following states:

- ON
- OFF
- SLOW FLASH
- BLINK

Each system must be equipped with the following:

Digital Output Controller Boards. Each board capable of driving 128 output points and rated at 30 VDC at 160 milliamps per point. Quantity to be determined by the total number of indication devices plus future capacity.

Logic and LED power supplies.

Logic and LED power wiring and communication cables for all output points.

Map board display control system software user's license.

Controller display system documentation and maintenance manual.

The SCDCS electronics and the Digital Output Controller Boards must be standard 19" rack mountable and be located behind the map board. All electronics must be shielded to prevent any electrical hazards.

The Digital Output Controller Boards must be located at several locations behind the map board support structure in order to limit the dynamic indicator cables to 10 feet.

### 2.7.3 Wiring

Dynamic Indicator cables must terminate at the driver modules with individual mass termination connector plugs. All cables must be 22 AWG, stranded wire with PVC insulation. Each cable must have a maximum of 10 feet in length and be clearly labeled at both driver and indicator termination ends.

Power wiring, cables, and cable bundles must meet the National Electric Code and any local applicable codes. All wiring for LED assemblies must be neatly routed and shaped, and be bundled and supported with wire tie wraps. All power cables must be stranded copper conductor sized according to the National Electric Code with insulation rated at 600 VAC. There must be no wire splices and all wire must be UL listed.

Suppliers' wiring and devices must be engineered to prevent the introduction of any electrical interference (noise) or errant signals into the host computer system.

#### 2.7.3.1 AC Distribution Wiring

Convenience receptacle outlets must be placed every 12 feet in the rear of the map board for maintenance purposes. Connection to the AC power supply must be via screw termination housed inside an approved wiring enclosure. All wiring devices, cable and conduit must be sized and rated for 115VAC@15 Amps and conform to the National Electric Code.

## 2.8 VIDEO PROJECTION SYSTEM TECHNICAL REQUIREMENTS - FUNCTIONAL

The video projection system herein termed **VPS**, must provide the [CCAFBEICF] with a virtual, multiple application environment of two (2) separate display areas within the mosaic map board. The VPS utilizing rear projection technology must be located approximately twelve (12) ft. from the seated position of each dispatch operator. The VPS must provide dynamic representation of the Distribution Dispatch SCADA system.

Each side of the overview display board must house a two (2) high by two (2) wide matrix of video projection cubes. A total of eight (8) projection cubes comprise the two (2) display areas. The projection cubes incorporate rear projection technology and are stackable units that are serviceable from the front and rear access areas and are rated for 24 hour by 365 day continuous operation.

Each display area, dual two (2) by two (2) matrices, incorporates a high-end, continuously operational video display processor. The networked video display processor manages the application display windows across the display area. The operator controlling the video display area custom sizes applications resident on the processor or LAN based network to provide dynamic changes to the display area.

The video projection system is integrated into the mosaic map board structure system by utilizing existing frame members and cross members for placement of the video projection units and processor units as detailed in [Appendix D, drawing number 2907-08-01].

## 2.9 VIDEO PROJECTION SYSTEM TECHNICAL REQUIREMENTS - EXPANSION AND MODIFICATION

The overview display board structure must have built-in video display expansion areas incorporated into the structure design. Specifically, each matrix of projection cubes must be expandable to an additional two (2) units stacked vertically and oriented on the farthest side of matrix with regard to the center of the overview display board.

Fascia panels constructed with the same criteria identical to Section 2.3.5 must be fabricated to fill the expansion location.

Expansion of the video projection system to incorporate Section 2.9.1 must require no more than removing the fascia panels, bolting the projection cubes in place, supplying power to the AC wiring system, supplying communication wiring to the processor, configuring the processor and performing alignment and color balancing of the projection cubes.

## 2.10 VIDEO PROJECTION SYSTEM PROJECTION SYSTEM TECHNICAL REQUIREMENTS - MECHANICAL

### 2.10.1 Projection Cube Display Unit

The Projection Display Units must be modular self-contained rear projection cubes. Each projection cube must consist of a data/graphics projector, optical quality mirrors, a high contrast rear projection screen, and signal interface modules contained in a modular light-tight cabinet. The projector must be adjustable for precise alignment of the projected image. All projection units must be identical, and must be designed to interlock together to form a rigid display wall when assembled in a multiple screen array.

#### 2.10.2 Data/Graphics Projector

The data/graphics projectors contained in each cube display unit must be high-resolution Advanced Performance Liquid Crystal Display (AP/LCD) or Digital Light Processing (DLP) technology single lens projectors meeting the following criteria:

Minimum Resolution: 625 pixels per square inch at the screen surface

Minimum Screen Brightness: 110 ftL measured at the screen surface with High-gain acrylic screen

Contrast Ratio: >300:1 minimum

Colors: 16.7 Million

Resolution: 800 x 600 pixels (SVGA) minimum

Border (mullion): 0.020" (0.5mm) maximum

Lamp Life: Minimum 6,000 hours - Nominal 8,000 hours in continuous 24 hour 7 days per week operation.

#### 2.10.3 Maintainability

Mean Time Between Failure (MTBF) of greater than 20,000 hours (excluding the projection lamp) in continuous 24 hour 7 days per week operation, and a Mean Time to Repair (MTTR) of less than 15 minutes per major assembly.

#### 2.10.4 Projection Cube Display Screen

The display unit rear-projection screens must be wide-angle, high-contrast, rear-projection screens single-element acrylic plastic, designed specifically for use with high-brightness single lens projectors. The screens must be optimized for high contrast, and must be dark tinted or coated to enhance the perceived contrast in rooms with high ambient light. The viewing side of the screens must have an anti-glare surface that eliminates glare and provides a protective covering for the screen. Reflectance of ambient room light must be less than 8%. The screens must have a minimum gain of 1.0 gain on axis, horizontal and vertical viewing angle +35 degrees from the center axis minimum. The size of the individual screens must be 40" measured diagonally (24" H x 32" W, nominal).

#### 2.11 VIDEO PROJECTION SYSTEM TECHNICAL REQUIREMENTS - CONFIGURATION

The VPS must be configured in two (2) separate display areas, each a two (2) high by two (2) wide matrices of 40" diagonal projection cubes. Each total display area screen footprint:

Description	Total	Unit Measure
-------------	-------	--------------

Total Screen Height	48 Inches	Total Screen Width	64 Inches	Total Display Square/Foot	21.344	Feet	Total Horizontal Resolution	1,600	Pixels	Total Vertical Resolution	1,200	Pixels	Total Addressable Pixels	1,920,000	Pixels	Pixels per square/inch	625	Pixels/inch <sup>2</sup>	Minimum Character Height	* 0.403	Inches
---------------------	-----------	--------------------	-----------	---------------------------	--------	------	-----------------------------	-------	--------	---------------------------	-------	--------	--------------------------	-----------	--------	------------------------	-----	--------------------------	--------------------------	---------	--------

The Minimum Character Height\* is measured by placing a 46" diagonal

application window (27.6" High by 36.8 wide) across the total screen area. A 12 point font viewed from 12 feet from the screen surface is 0.403" inches in height. This character height is required for ergonomic view ability based upon stated environmental conditions.

## 2.12 VIDEO PROJECTION SYSTEM TECHNICAL REQUIREMENTS - EXPANSION CONFIGURATION

### 2.12.1 Design Criteria for Future Integration

The VPS must be expanded to an ultimate configuration of two (2) separate display areas, each a two (2) high by three (3) wide matrices of 40" diagonal projection cubes. Each total display area screen footprint:

Description	Total	Unit Measure
-------------	-------	--------------

Total Screen Height	48 Inches	Total Screen Width	96 Inches	Total Display Square/Feet	32 Feet	Total Horizontal Resolution	2,400 Pixels	Total Vertical Resolution	1,200 Pixels	Total Addressable Pixels	2,880,000 Pixels	Pixels per square/inch	625 Pixels/inch <sup>2</sup>	Minimum Character Height	0.403 Inches
---------------------	-----------	--------------------	-----------	---------------------------	---------	-----------------------------	--------------	---------------------------	--------------	--------------------------	------------------	------------------------	------------------------------	--------------------------	--------------

## 2.13 VIDEO PROJECTION SYSTEM TECHNICAL REQUIREMENTS - VIDEO PROCESSOR

Each video display area is controlled by one (1) video display processor, thereby requiring a total of two (2) processors. Each processor must be provided with one (1), quad (4) graphics output channels and one (1) expansion dual (2) graphics output channels for a total of six (6) graphics output channels. The processor onboard each of these expansion cards must be utilized to process the video for that channel as well as the graphics. The display wall processor must provide six (6) composite video inputs that are capable of receiving NTSC, PAL, SECAM formats or any combination of these. The processor must have the capability of one displayed video window per installed graphics channel. The graphics adapters must have no less than 4 MB of SGRAM per channel. The graphics resolution of these output adapters must display the following resolutions: 640 x 480, 800 x 600, 1024 x 768, 1280 x 1024, and 1600 x 1200, in 16.7 Million colors at 85Hz.

The display wall processor must be based on the Single Intel platform and have the capabilities of the Pentium III CPU and no less than 256 MB of ECC SDRAM supplied by the display wall processor manufacturer. The display wall processor typically features no less than seven PCI slots, a single high-speed EPP/ECP parallel port, at least a 48 x EIDE CDROM, a 1.44 MB FDD and no less than a 6.5 GB UDMA/33 HDD. The system must also be provided with a PCI quad-channel 100 Mbps Fast Ethernet adapter. The system must come equipped with a keyboard and mouse. The display wall processor must be rack mountable with its own cooled power supply and two additional case fans. BIOS monitoring of the CPU fan is recommended to maintain the durability and functionality required in 24-7 operations. The graphical output cards, fan cooling system and power supplies must all be hot-swap components. The display wall processor must be supplied with uninterruptible power and located in a ventilated equipment rack placed within the overview display board structure no more than 125 feet from the corresponding projection cube location.

The Display Wall Processor's Operating System must be at least Microsoft Windows 2000 installed and tested. The manufacturer must make available for one year from site acceptance testing (SAT) all operating system upgrades of Microsoft Windows.



The Display Wall Management software must allow [CCAFBEICF] authorized users on the network to access and control their desktops as windows on the display wall. The software must provide profiles or presets by which common usage is stored and retrieved. Through software mounted on the workstation, users must be able to effect keyboard and mouse manipulation of the images on the display wall. This allows the display wall processor's mouse and keyboard to be manipulated from a local workstation. The display wall management software, which allows the user control of the input to the high-resolution projection engines, enables the presentation of a single unified image. The image is a single logical desktop generated by the display wall processor. The unit must be capable of running software locally and this can be executed from an individual workstation's keyboard and mouse.

The Display Wall Processor network software must have a component that adds scalability, reliability and flexibility by providing critical link services, such as port aggregation, automatic failover and dynamic load balancing.

## 2.14 VIDEO PROJECTION SYSTEM TECHNICAL REQUIREMENTS - INTERCONNECTIONS

Supply all video and data cabling between component units of the VPS. Video and data cabling must meet the following requirements:

Use high performance, data-grade (EIA/TIA Enhanced Category 5) and appropriate Enhanced Category 5 connectors for all LAN interconnections. Documentation must identify specific precautions to be followed when installing and connecting these cables and connectors so that the full performance capabilities of this equipment can be utilized.

All cables running under raised flooring that is used as a return air plenum must be fire rated as required by NFPA. Identification of wires must be in accordance with MISO Signals standards, where each end of a wire must include a tag displaying the following information: (1) Wire from or function AND (2) where the wire goes. For example, From terminal location: 18TJR 36M or Function: 16HR To: 16HR 3E on a white vinyl engraved sleeve.

Use plug-type connectors with captive fasteners for all interconnections. The connectors must be polarized to prevent improper assembly. Each end of each interconnection cable must be marked with the cable number and the identifying number and location of each of the cable's terminations; this information must agree with the drawings. Each cable must be continuous between components; no intermediate splices or connectors must be used. Terminations must be entirely within the enclosures.

All redundant cabling must be route-diversified to prevent single-contingency loss of both redundant cable paths.

All power cord plugs must have a rating that matches the receptacle into which they connect. Detailed information regarding the receptacles being provided by the facility manager will be provided after contract award.

## PART 3 EXECUTION

### 3.1 SYSTEM B - OPERATOR CONSOLE SYSTEM

This section describes the functional, mechanical, electrical, and spare parts requirements for the specified operator console system.

### 3.2 OPERATOR CONSOLE SYSTEM TECHNICAL REQUIREMENTS - FUNCTIONAL

The operator console system must provide the [CCAFBEICF] with a robust, aesthetic and ergonomic workstation system. The entire operator console system must have the following functional requirements:

Accommodation of a full range of computers, monitors, printers, telecommunications devices and operator interface devices.

The console must be of modular design, for ease of facilitating future equipment retrofits and re-configurations without major modification to the structural frame, the interior components and exterior panels. Accomplish modifications to the console without the use of drilling special tools or machining in the field to the existing console.

Materials must be of industrial grade designed to withstand years of continuous twenty- four (24) hour by three hundred sixty-five (365) day control room use.

The contour must provide a large work area between each operator. The overall work-surface area must accommodate operational requirements during critical processes.

The operator console system design is detailed in [Appendix D, drawing number 2907-04-01] and is comprised of:

One (1) main operator console, herein termed **Main Console**, designed to allow comfortable access and working area for two (2) operators is stationed approximately twelve (12) feet from the overview display board. The console is shaped to include batwings on either side of the console and an extended work surface/undercounter storage area in the middle. The Supplier is responsible for integrating [CCAFBEICF] supplied components into the console.

One (1) supervisory operator console, herein termed **Ancillary Console**, designed to allow comfortable access and working area for one (1) operator are stationed approximately thirty (30) feet from the center of the overview display board. The console is shaped with a batwing contour. The Supplier is responsible for integrating [CCAFBEICF] supplied components into the console.

One (1) main mill-work credenza, herein termed **Credenza**, designed to offer work surface space and binder and rotary storage options. The credenza must be fabricated from matching plastic laminate materials used in the Main Console and Ancillary Console construction.

### 3.3 OPERATOR CONSOLE SYSTEM TECHNICAL REQUIREMENTS - STANDARD COMPONENTS

The Operator Console System must be constructed with the following standard components:

Aluminum extruded frame construction with hooded monitor well design

bay measuring thirty (30) inches wide from the ends of the frame members. Standard components in each bay include:

CPU hardware trays within the lower portion of the bay area utilizing AccuRide steel bearing full extension slides to provide ease of hardware removal.

Valance lighting incorporating an adjustable, high CRI, linear task light system specifically designed for the console environment to provide required light level at the work surface without adding glare to the display system. Task lighting must be mechanically dimming, without any impact on light color rendition, using individual operator controls. A mechanical shutter-type dimmer with a 20 to 60% range is required for each operator position.

Each bay must have a modular ventilation fan and grill assembly that enhances natural convection air currents to maintain optimum operating temperatures within the console enclosure while minimizing fan noise. The brushless DC ventilation fan unit must attach to the underside of the console ventilation grill to increase the ventilation process by reducing or eliminating the heat buildup created by the internal electronic components (monitor, CPU, etc.). The console system, as specified in this document, requires one (1) fan per grill with air exhaust slats in the top of the console.

Monitor placement bays with black trim bezel surrounding a optical quality glare control glass 3mm thick tempered with anti-glare coatings on both faces of the glass hinged to open towards the operator to allow access to the monitor. The monitor bay also includes a tilting hardware tray constructed of perforated metal to enhance air movement within the console.

Power distribution facilitated by a 120VAC convenience outlet mounted on the each end of the console.

Work surface grommets located at monitor bays and centered between the work surface area and the monitor bezel.

### 3.4 OPERATOR CONSOLE SYSTEM TECHNICAL REQUIREMENTS - EQUIPMENT KITS

The operator console system must include the ability to integrate the following components into the standard console design:

Millwork end-units with file and box drawer storage unit.

Articulating arm task lighting.

Articulated keyboard shelf.

Pencil drawer designed to be concealed when not in use.

19" rack mount panels.

Binder and storage compartments.

Form and paper organizers.

Telephone support shelf.

Custom equipment fronts/bezels.

Audio/visual equipment.

### 3.5 OPERATOR CONSOLE SYSTEM TECHNICAL REQUIREMENTS - STRUCTURAL COMPONENTS

The dual operator console system must be constructed with the following components:

6061-T6 Alloy aircraft grade aluminum structural frame strut with fastening of brackets and cantilevered frame members via standard fasteners.

The structural frames must support the exterior panel elements and the various equipment mounting kits and accessories, (such as slice out processor trays, equipment front mullions, CRT shelves).

The structural frame must readily accept future reconfigurations and additions with no on site cutting, drilling or machining required.

Manufacturing tolerances must be: Linear +/- 0.5 mm and vertically +/- 0.5 degrees.

The modular base units must be designed with leveling legs and with 50mm foot pads having a minimum of 1.5 inch vertical height adjustment for mounting on the existing floor.

All equipment must be capable of accepting rack-mounted hardware.

### 3.6 OPERATOR CONSOLE SYSTEM TECHNICAL REQUIREMENTS - EXTERIOR PANEL CONSTRUCTION

The exterior panels must be supported by and enclose the structural frame. The panels must be easily removed for convenient access to the equipment mounted in the console. The supplier must provide plastic laminate color options at the time of design submittal and includes the following requirements:

Console Enclosure Cladding must be fabricated from composite core with (both sides) and color matched PVC edges.

Cladding must be attached to console frame with concealed fastening.

Equipment facings are easily removed without the use of tools for quick access.

Optional hinged top and/ or side panels.

Access doors and panels must be of high pressure plastic laminate with 3/3 -inch composite core.

Enclosure panels must be high-pressure plastic laminate with minimum 40-pound density particle board with backer sheet of high-pressure plastic laminate.

Custom size all panel equipment cut-out for each piece of equipment.

Finish all edges and all exposed facing corners with plastic laminate to insure a monolithic color and texture. Permit no detail which

causes eye distraction.

### 3.7 OPERATOR CONSOLE SYSTEM TECHNICAL REQUIREMENTS - WORK SURFACE CONSTRUCTION

The horizontal work surface must be constructed of the following characteristics:

High pressure plastic laminate clad wood products, 1.125-inch thick industrial grade particle board.

The work surface edge trim must be constructed of 3MM Edge Banding solid surface bull-nose with plastic laminate finish.

The work surface design height must be 29.5-inches above the finished floor.

The aluminum extrusion frame must extend forward to support the laminate work surface.

### 3.8 OPERATOR CONSOLE SYSTEM TECHNICAL REQUIREMENTS - ELECTRICAL POWER DISTRIBUTION

A UL approved plug-in power outlet strip unit rated at 120 VAC @ 15 Amps with a minimum of six grounding type receptacles is required at each modular workstation. The outlet unit must also contain a lighted on-off switch and breaker/reset button. Unit must be located in the console interior and must have a cord set a sufficient length of four (3) foot minimum.

Power/Data/Communications distribution system must be installed contiguous throughout all bays.

Fit task, valance lighting and ventilation fans with appropriate plugs. Lengths of wire to be determined at the factory by accessing appropriate power supply outlets in the raceway.

Provide each console with one grounding location. All metallic components of the console assembly must be interconnected and bonded to this ground location by supplier. Owner must connect the console to the building grounding system. Grounding wire must be networked through the console neatly at a level even with the top of the baseboard. Wire to be strung tightly to minimize interference with other components of the console.

### 3.9 OPERATOR CONSOLE SYSTEM TECHNICAL REQUIREMENTS - WIRING/CABLE RACEWAY

Each console is to be provided with continuous raceway with a minimum of 2-duplex outlets (surge protected) in each bay. Two standard data telephone grommet holes to be provided for each module. Each modular unit must be constructed to provide a clear access way for wires and cables to be routed from one end of the fully assembled console to the other without restriction.

Plug all electrically operated hardware directly to the raceway located in each console. All junction boxes provided for outlets can be either mustow or deep profile. Color of these accessories must match the bezel laminate.

-- End of Section --